

To begin therefore, it is manifest from several circumstances, that the material cause of the *apparition* of these several Colours, is some *Lamina* or Plate of a transparent or pellucid body of a thickness very determinate and proportioned according to the greater or less refractive power of the pellucid body. And that this is so, abundance of Instances and particular Circumstances will make manifest.

As first, if you take any small piece of the *Muscovy-glass*, and with a Needle, or some other convenient Instrument, cleave it oftentimes into thinner and thinner *Lamine*, you shall find, that till you come to a determinate thinness of them, they shall all appear transparent and colourless, but if you continue to split and divide them further, you shall find at last, that each Plate, after it comes to such a determinate thickness, shall appear most lovely ting'd or imbued with a determinate colour. If further, by any means you so flay a pretty thick piece, that one part does begin to cleave a little from the other, and between those two there be by any means gotten some pellucid *medium*, those *laminated* pellucid bodies that fill that space, shall exhibit several Rainbows or coloured Lines, the colours of which will be disposed and ranged according to the various thicknesses of the several parts of that Plate. That this is so, is yet further confirmed by this Experiment.

Take two small pieces of ground and polish'd Looking-glass-plate, each about the bigness of a shilling, take these two dry, and with your fore-fingers and thumbs press them very hard and close together, and you shall find, that when they approach each other very near, there will appear several *trises* or coloured Lines, in the same manner almost as in the *Muscovy-glass*; and you may very easily change any of the Colours of any part of the interposed body, by pressing the Plates closer and harder together, or leaving them more lax; that is, a part which appeared coloured with a red, may be presently ting'd with a yellow, blew, green, purple, or the like, by altering the appropinquation of the terminating Plates. Now that air is not necessary to be the interposed body, but that any other transparent fluid will do much the same, may be tryed by wetting those approximated Surfaces with Water, or any other transparent Liquor, and proceeding with it in the same manner as you did with the Air; and you will find much the like effect, only with this difference, that those compressed bodies, which differ most, in their refractive quality, from the compressing bodies, exhibit the most strong and vivid tinctures. Nor is it necessary, that this *laminated* and *ting'd* body should be of a fluid substance, any other substance, provided it be thin enough and transparent, doing the same thing: this the *Lamina* of our *Muscovy-glass* hint; but it may be confirm'd by multitudes of other Instances.

And first, we shall find, that even Glass it self may, by the help of a Lamp, be blown thin enough to produce these *Phænomena* of Colours: which *Phænomena* accidentally happening, as I have been attempting to frame small Glasses with a Lamp, did not a little surprize me at first, having never heard or seen any thing of it before; though afterwards comparing it with the *Phænomena*, I had often observed

observed in those Bubbles which Children use to make with Soap-water, I did the less wonder; especially when upon Experiment I found, I was able to produce the same *Phænomena* in thin Bubbles made with any other transparent Substance. Thus have I produced them with Bubbles of Pitch, Rosin, Colophony, Turpentine, Solutions of several Gums, as Gum-Arabick in water; any glutinous Liquor, as Wort, Wine, Spirit of Wine, Oyl of Turpentine, Glare of Snails, &c.

It would be needless to enumerate the several Instances, these being enough to shew the generality or universality of this propriety. Only I must not omit, that we have instances also of this kind even in metalline Bodies and animal; for those several Colours which are observed to follow each other upon the polish'd surface of hardned Steel, when it is by a sufficient degree of heat gradually tempered or softened, are produced from nothing else but a certain thin *Lamina* of a vitrum or vitrified part of the Metal, which by that degree of heat, and the concurring action of the ambient Air, is driven out and fixed on the surface of the Steel.

And this hints to me a very probable (at least, if not the true) cause of the hardning and tempering of Steel, which has not, I think, been yet given, nor, that I know of, been so much as thought of by any. And that is this, that the hardness of it arises from a greater proportion of a vitrified Substance interspersed through the pores of the Steel. And that the tempering or softning of it arises from the proportionate or smaller parcels of it left within those pores. This will seem the more probable, if we consider these Particulars.

First, That the pure parts of Metals are of themselves very flexible and tuff; that is, will indure bending and hammering, and yet retain their continuity.

Next, That the Parts of all vitrified Substances, as all kinds of Glass, the *Scoria* of Metals, &c. are very hard, and also very brittle, being neither flexible nor malleable, but may by hammering or beating be broken into small parts or powders.

Thirdly, That all Metals (excepting Gold and Silver, which do not so much with the bare fire, unless assisted by other saline Bodies) do more or less vitrify by the strength of fire, that is, are corroded by a saline Substance, which I elsewhere shew to be the true cause of fire; and are thereby, as by several other *Menstruums*, converted into *Scoria*; And this is called, *calcining* of them, by Chimists. Thus Iron and Copper by heating and quenching do turn all of them by degrees into *Scoria*, which are evidently vitrified Substances, and unite with Glass, and are easily fusible; and when cold, very hard, and very brittle.

Fourthly, That most kind of *Vitrifications* or *Calcinations* are made by Salts, uniting and incorporating with the metalline Particles. Nor do I know any one *calcination* wherein a *Saline* body may not, with very great probability, be said to be an agent or coadjutor.

Fifthly, That Iron is converted into Steel by means of the incorporation of certain salts, with which it is kept a certain time in the fire.

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Sixthly,